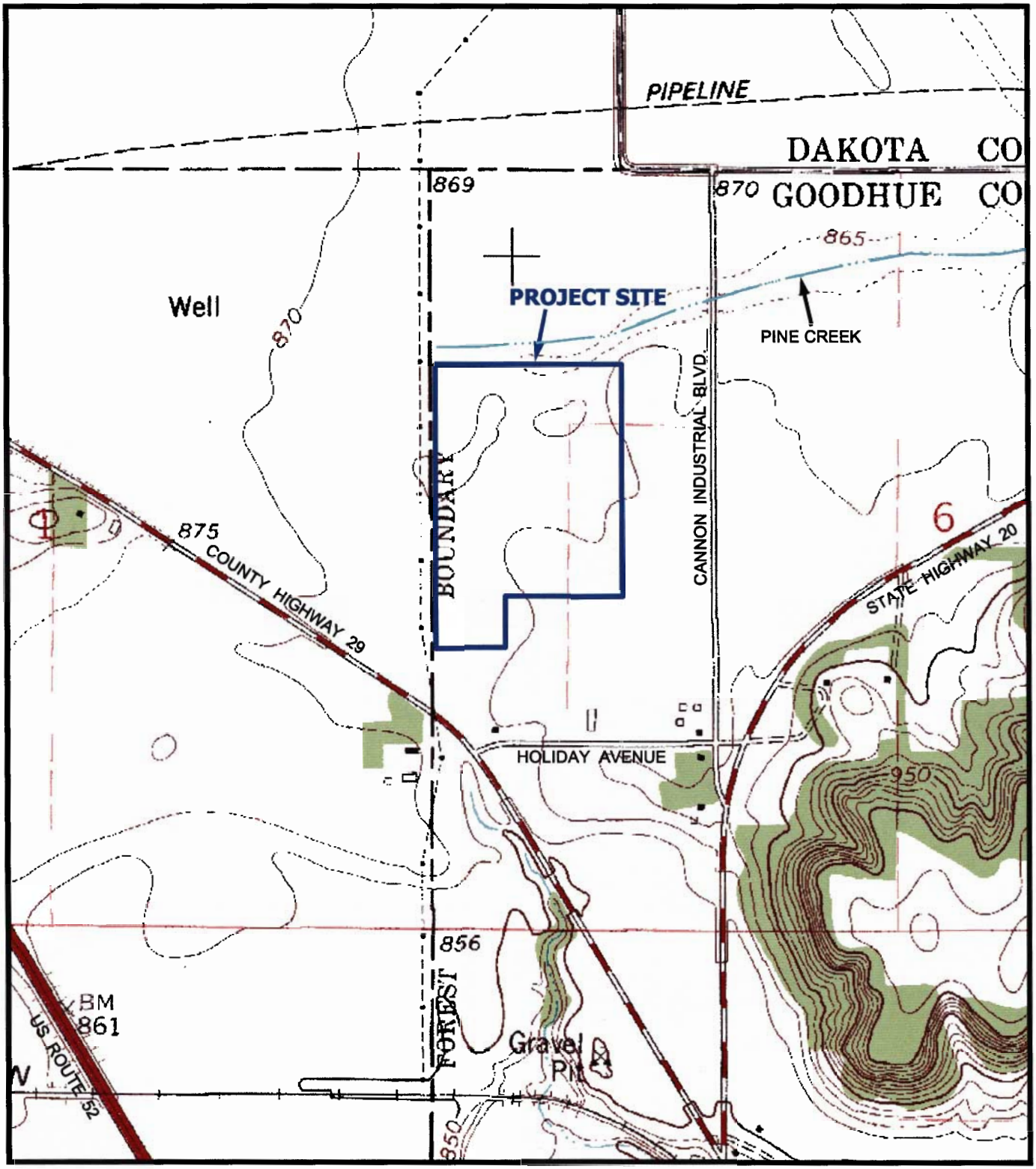
FIGURES



MAP REFERENCE:

PORTION OF U.S.G.S. QUADRANGLE MAP
7 ½ MINUTE SERIES (TOPOGRAPHIC)
CANNON FALLS, MINNESOTA 1974

NORTH

500 0 500 1000

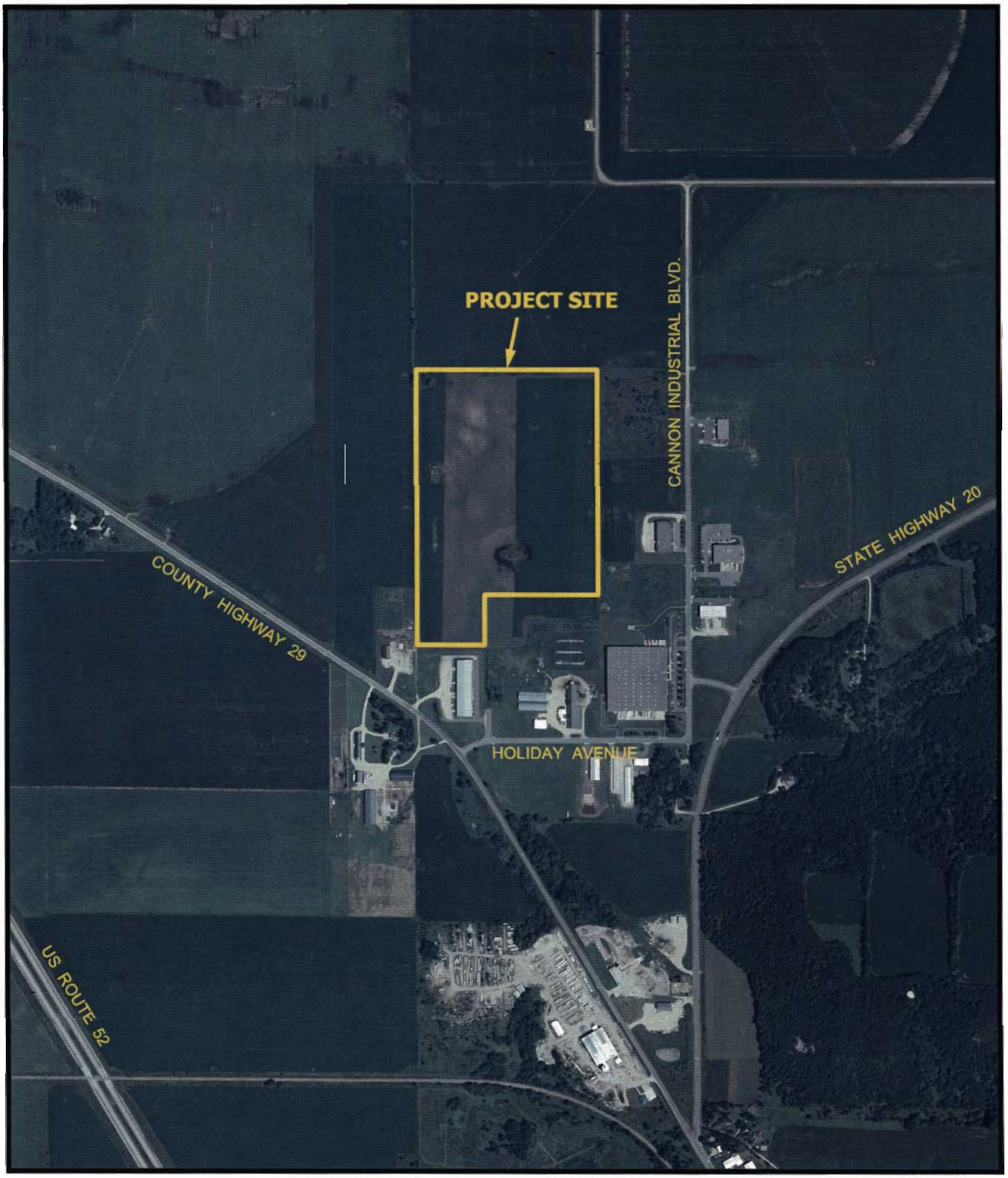
SCALE IN FEET

CANNON FALLS ENERGY CENTER
CANNON FALLS, MINNESOTA

FIGURE 1
PROJECT SITE MAP

DATE: JUNE 10, 2004	
JOB NO.: 25365157	
DRAWN BY: MAR	CHK'D BY: EM
SCALE: AS SHOWN	

URS
1701 GOLF ROAD, SUITE 1000
ROLLING MEADOWS, ILLINOIS 60008
PHONE: 847.228.0707
FAX: 847.228.1115



AERIAL MAP REFERENCE:

PORTION OF MINNESOTA DEPARTMENT OF NATURAL RESOURCE;
FARM SERVICES AGENCY (FSA) COLOR ORTHOPHOTOS (DOQs) DATED 2002
CANNON FALLS, DAKOTA COUNTY, MINNESOTA

NORTH

500 0 500 1000

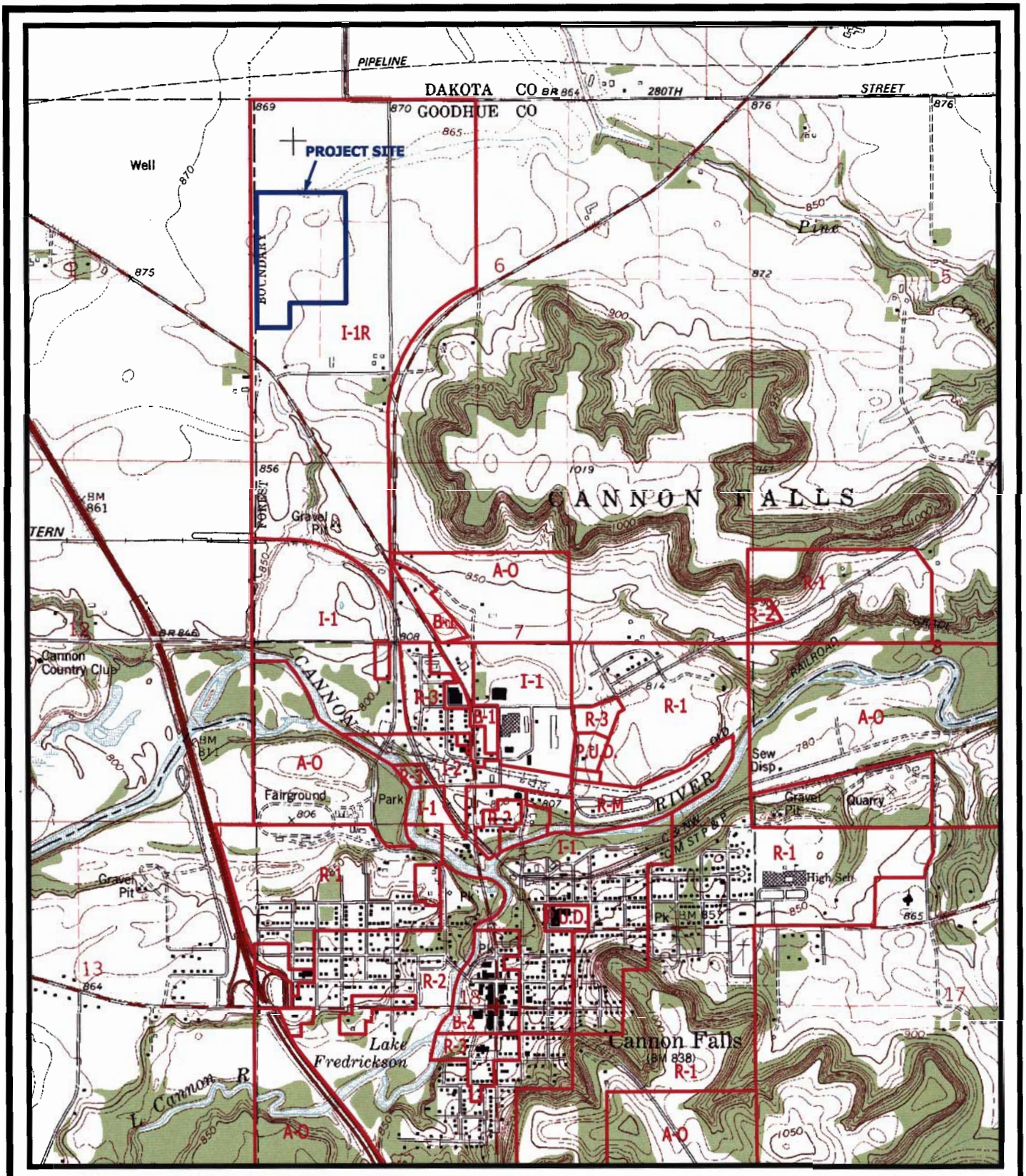
SCALE IN FEET

CANNON FALLS ENERGY CENTER
CANNON FALLS, MINNESOTA

FIGURE 2
PROJECT SITE AERIAL MAP

DATE: JUNE 28, 2004	
JOB NO.: 25365157	
DRAWN BY: MAR	CHK'D BY: EM
SCALE: AS SHOWN	

URS
1701 GOLF ROAD, SUITE 1000
ROLLING MEADOWS, ILLINOIS 60008
PHONE: 847.228.0707
FAX: 847.228.1115



NORTH

1000 0 1000 2000

SCALE IN FEET

QUADRANGLE LOCATION

MAP REFERENCE:

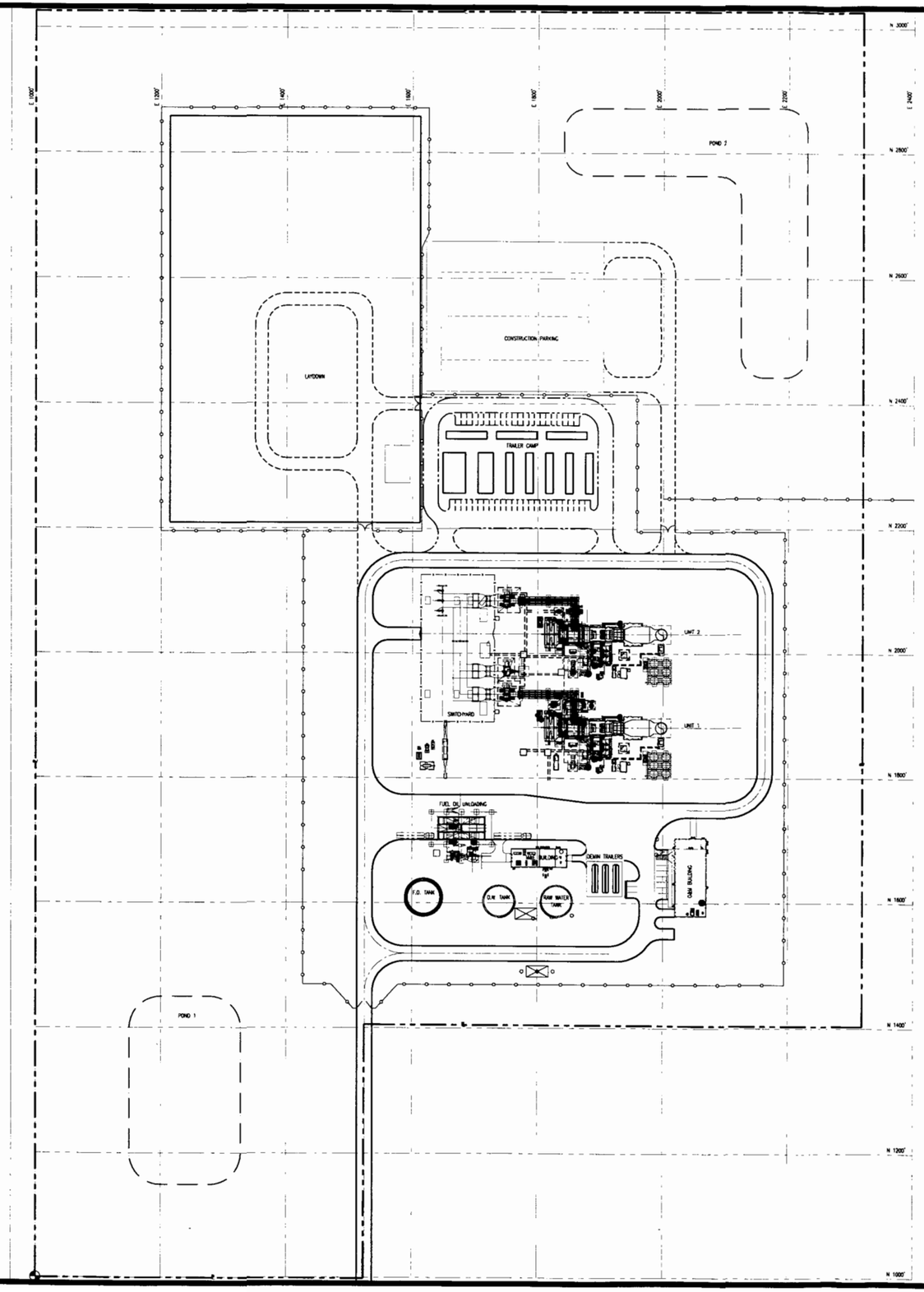
PORTION OF U.S.G.S. QUADRANGLE MAP
7 ½ MINUTE SERIES (TOPOGRAPHIC)
CANNON FALLS, MINNESOTA 1974

CANNON FALLS ENERGY CENTER
CANNON FALLS, MINNESOTA

FIGURE 3
PROJECT AREA ZONING MAP

DATE: JULY 12, 2004	
JOB NO.: 25365157	
DRAWN BY: MAR	CHK'D BY: EM
SCALE: AS SHOWN	

URS
1701 GOLF ROAD, SUITE 1000
ROLLING MEADOWS, ILLINOIS 60008
PHONE: 847.228.0707
FAX: 847.228.1115



NORTH

BAR SCALE

0 200' 400' 600'

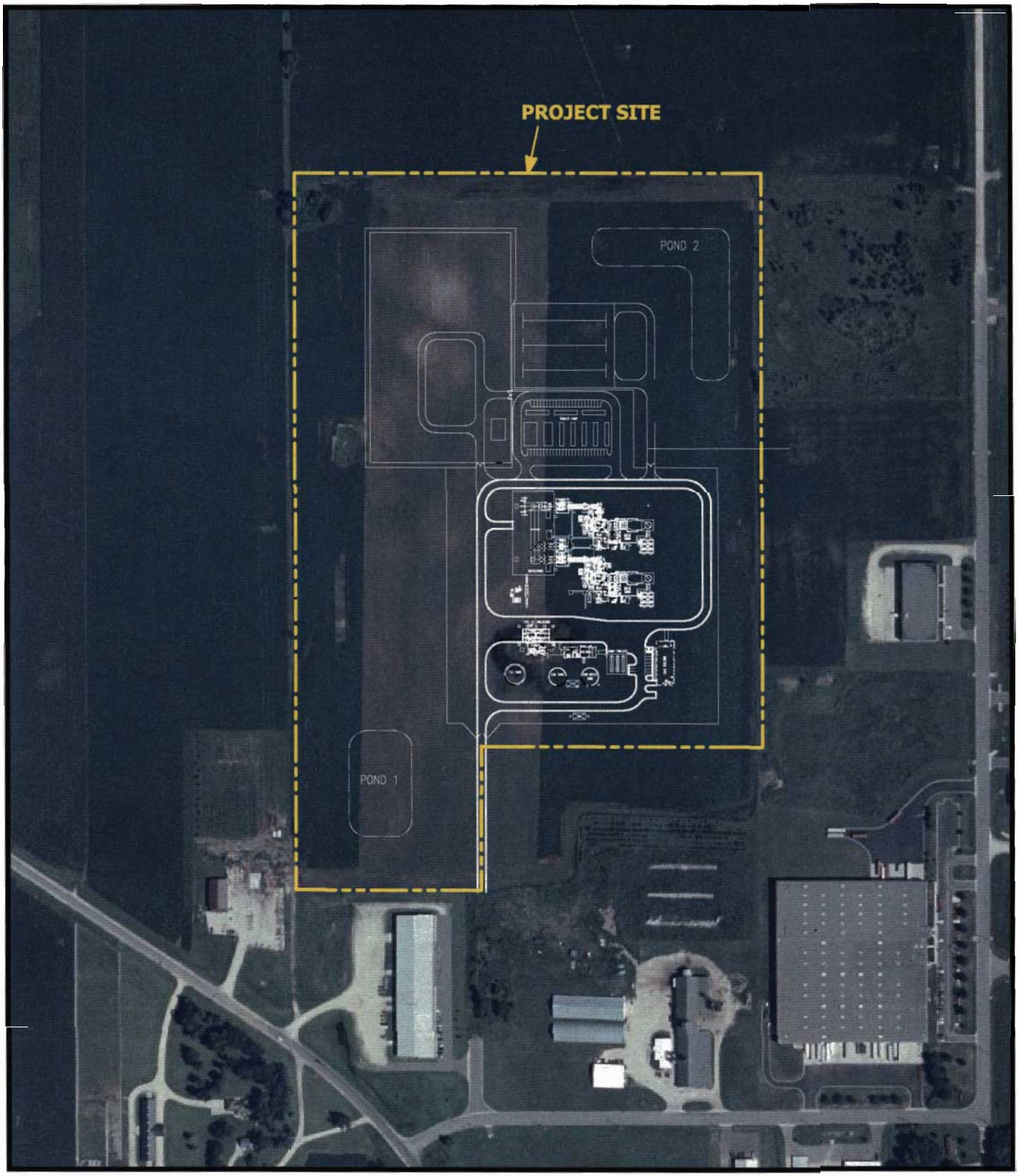
SCALE: 1"=200'-0"

CANNON FALLS ENERGY CENTER
CANNON FALLS, MINNESOTA

FIGURE 4
PROJECT LAYOUT

DATE: JULY 30, 2004
JOB NO.: 25365157
DRAWN BY: MAR | CHK'D BY: EM
SCALE: AS SHOWN

URS
1701 GOLF ROAD, SUITE 1000
ROLLING MEADOWS, ILLINOIS 60008-4227
PHONE: 847.228.0707
FAX: 847.228.1115



AERIAL MAP REFERENCE:

PORTION OF MINNESOTA DEPARTMENT OF NATURAL RESOURCE;
FARM SERVICES AGENCY (FSA) COLOR ORTHOPHOTOS (DOQs) DATED 2002
CANNON FALLS, DAKOTA COUNTY, MINNESOTA

NORTH

200 0 200 400

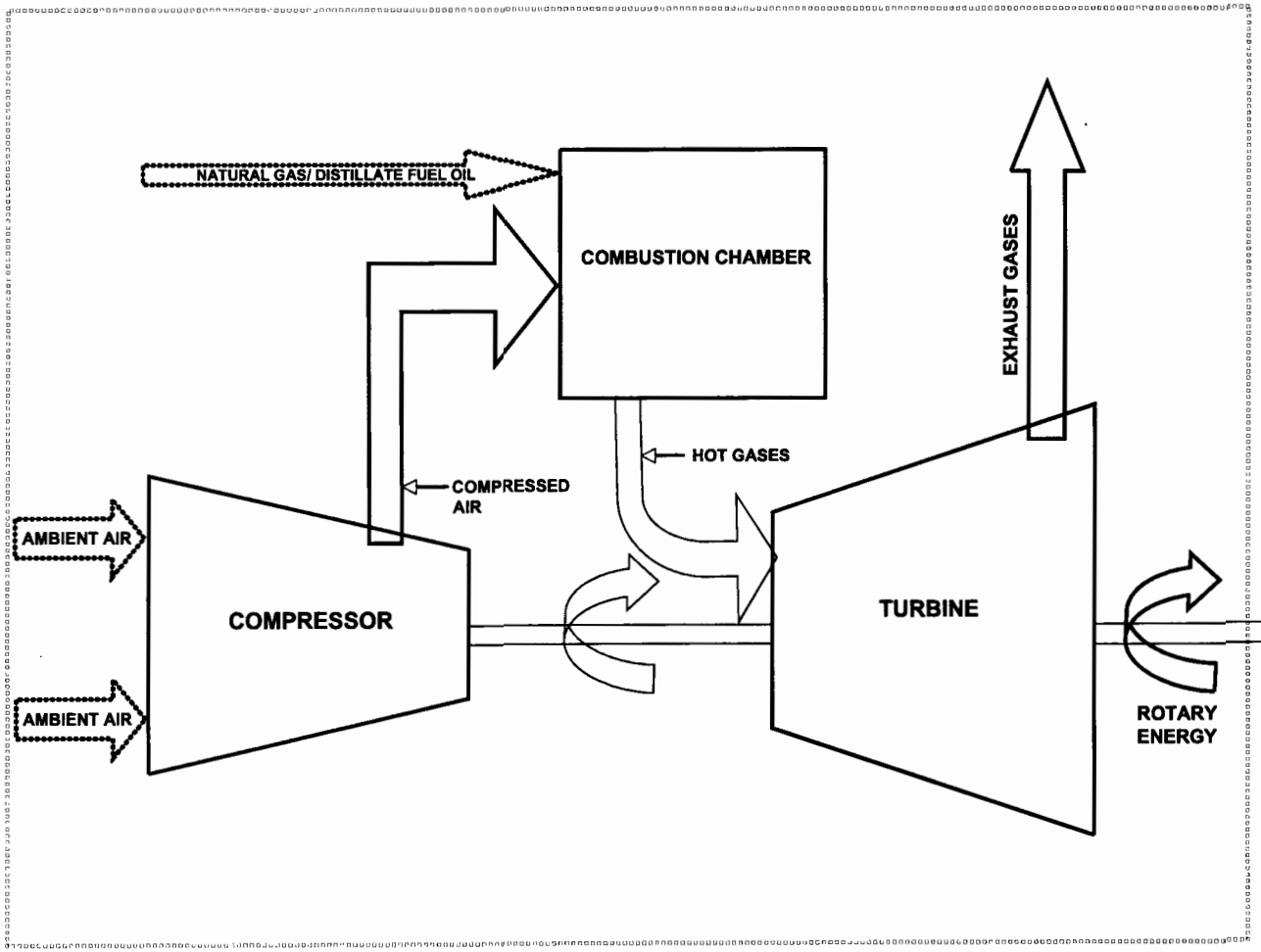
SCALE IN FEET

CANNON FALLS ENERGY CENTER
CANNON FALLS, MINNESOTA

FIGURE 5
PROJECT LAYOUT AERIAL OVERLAY

DATE: JULY 31, 2004	
JOB NO.: 25365157	
DRAWN BY: MAR	CHK'D BY: EM
SCALE: AS SHOWN	

URS
1701 GOLF ROAD, SUITE 1000
ROLLING MEADOWS, ILLINOIS 60008
PHONE: 847.228.0707
FAX: 847.228.1115

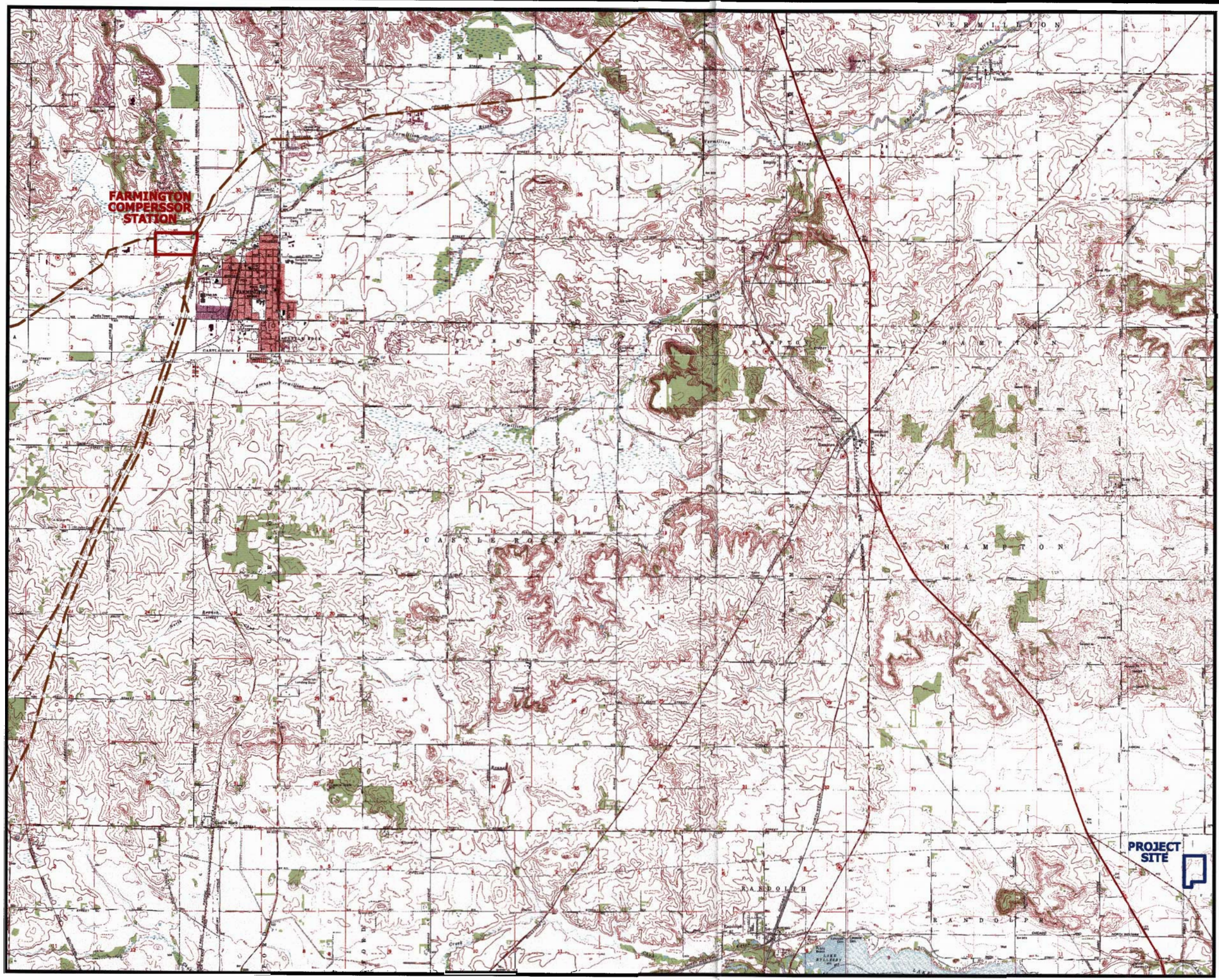


CANNON FALLS ENERGY CENTER
CANNON FALLS, MINNESOTA

FIGURE 6
PROCESS FLOW DIAGRAM -
COMBUSTION TURBINE GENERATOR

DATE: JULY 12, 2004	
JOB NO.: 25365157	
DRAWN BY: MAR	CHK'D BY: EM
SCALE: NOT TO SCALE	

URS
1701 GOLF ROAD, SUITE 1000
ROLLING MEADOWS, ILLINOIS 60008-4227
PHONE: 847.228.0707
FAX: 847.228.1115



NORTH

SCALE:

1 1.5 3 MILE

3000 0 3000 6000 FEET

0 1.5 3 KILOMETER

LEGEND:

= NATURAL GAS PIPELINE ROUTE

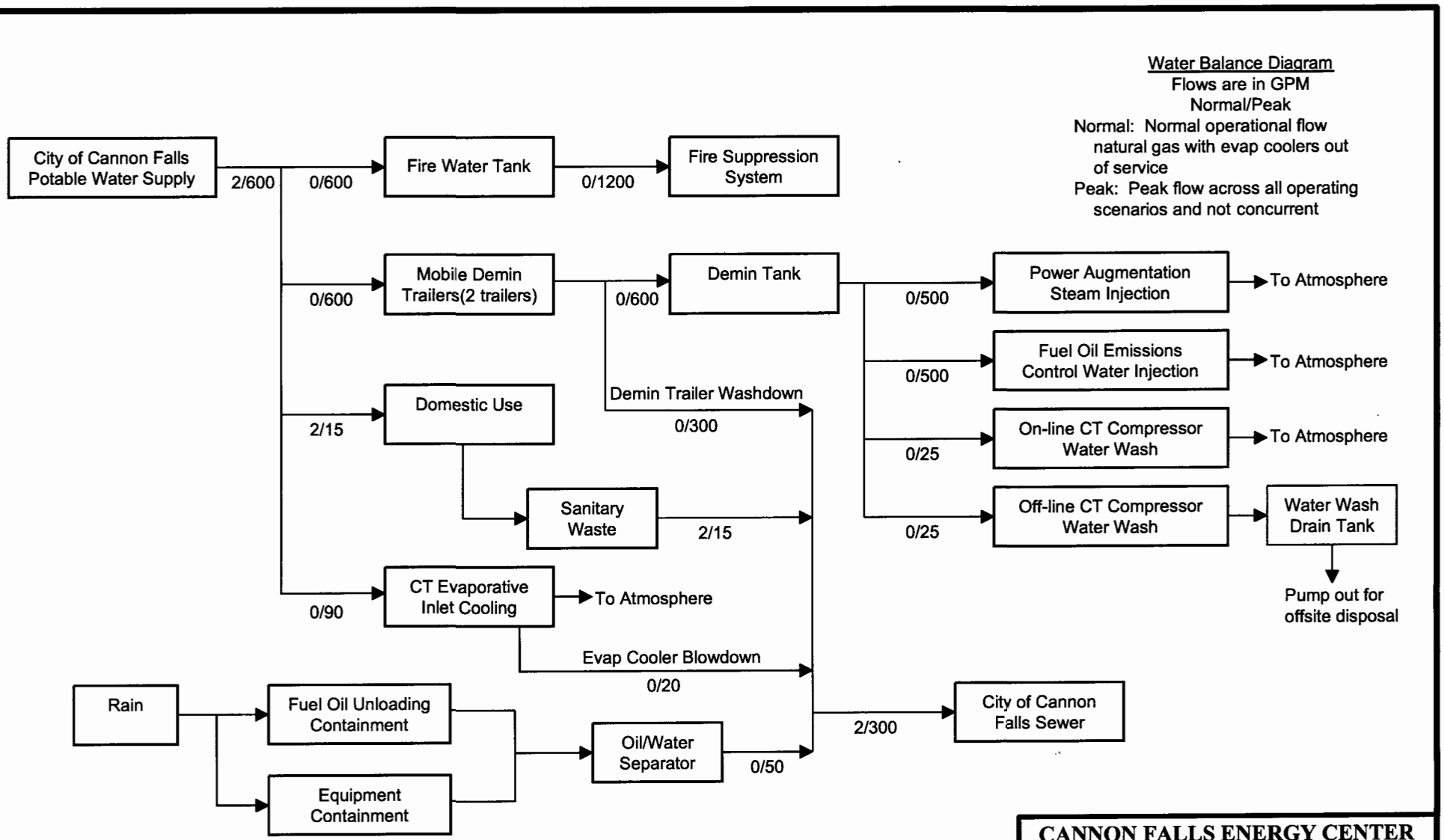
QUADRANGLE LOCATION

CANNON FALLS ENERGY CENTER
CANNON FALLS, MINNESOTA

FIGURE 7
EXISTING NORTHERN NATURAL GAS PIPELINE

DATE: AUGUST 16, 2004	
JOB NO.: 25365157	
DRAWN BY: MAR	CHK'D BY: EM
SCALE: AS SHOWN	

URS
1701 GOLF ROAD, SUITE 1000
ROLLING MEADOWS, ILLINOIS 60008
PHONE: 847.228.0707
FAX: 847.228.1115

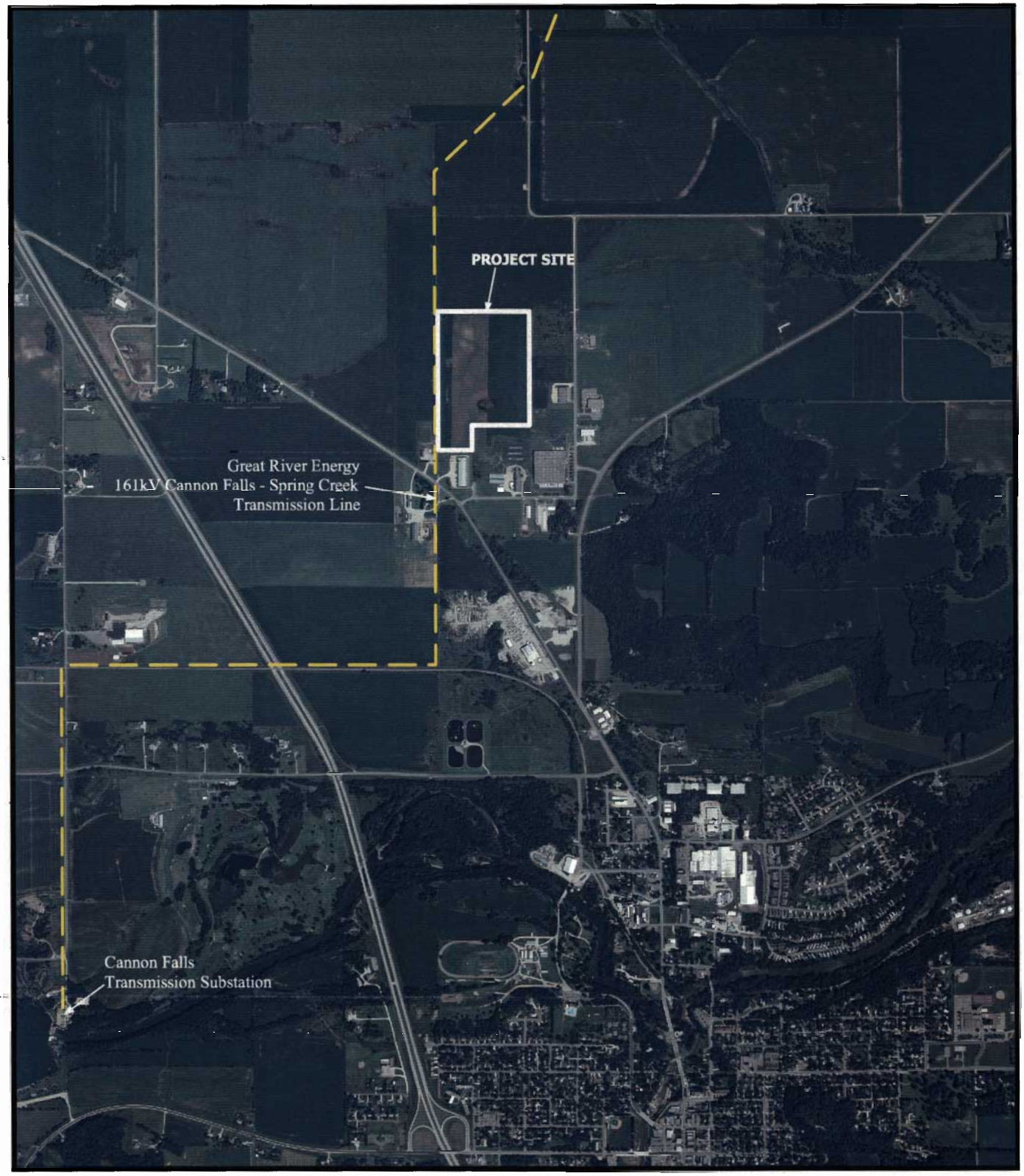


CANNON FALLS ENERGY CENTER
CANNON FALLS, MINNESOTA

FIGURE 8
FACILITY WATER USE DIAGRAM

DATE: JULY 12, 2004
JOB NO.: 25365157
DRAWN BY: MAR
CHK'D BY: EM
SCALE: NOT TO SCALE

URS
1701 GOLF ROAD, SUITE 1000
ROLLING MEADOWS, ILLINOIS 60008-4227
PHONE: 847.228.0707
FAX: 847.228.1115



LEGEND:

= TRANSMISSION LINE

NORTH

1000 0 1000 2000

SCALE IN FEET

AERIAL MAP REFERENCE:

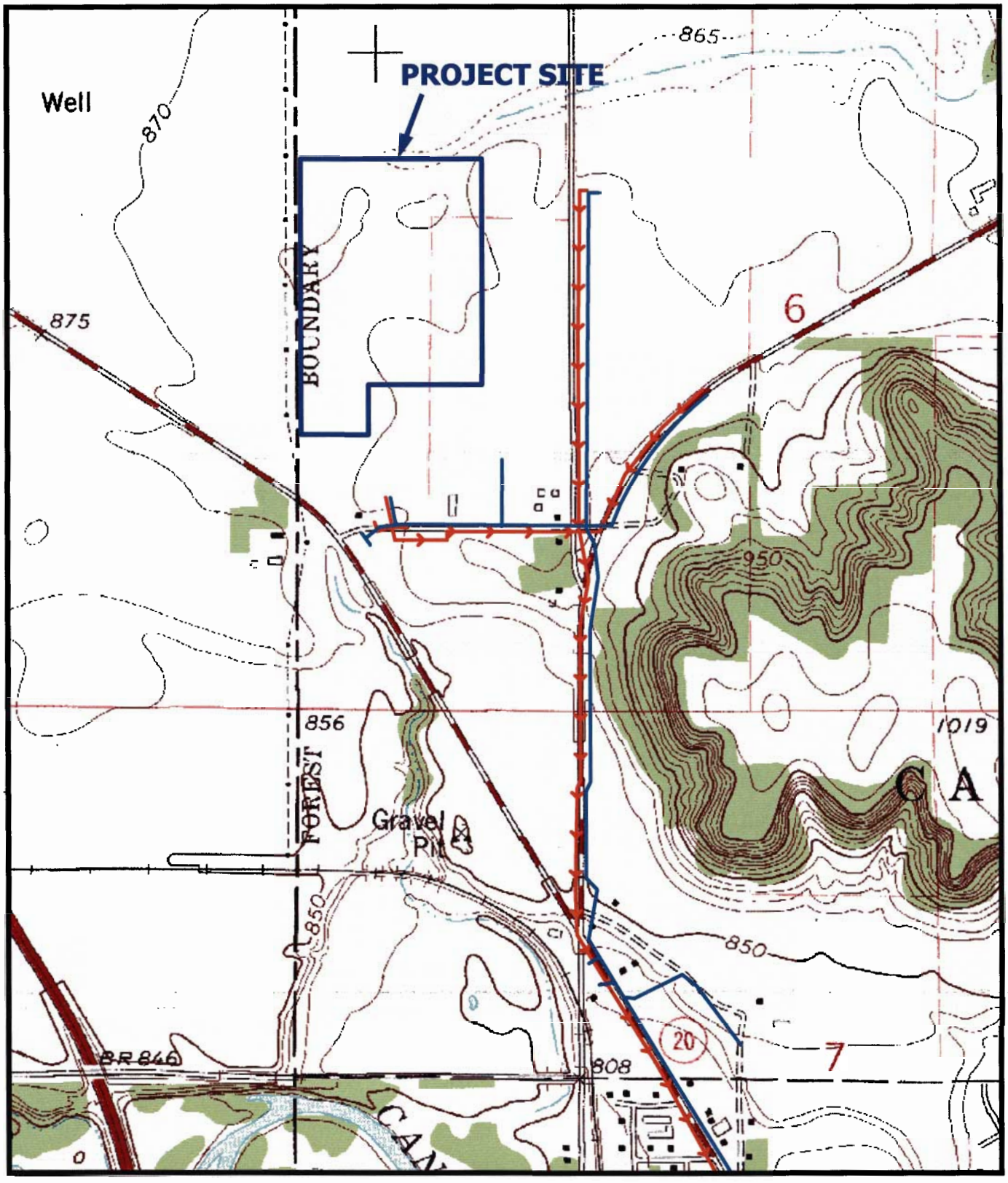
PORTION OF MINNESOTA DEPARTMENT OF NATURAL RESOURCE;
FARM SERVICES AGENCY (FSA) COLOR ORTHOPHOTOS (DOQs) DATED 2002
CANNON FALLS, DAKOTA COUNTY, MINNESOTA

CANNON FALLS ENERGY CENTER
CANNON FALLS, MINNESOTA

FIGURE 9
PROPOSED ELECTRIC INTERCONNECTION

DATE:	JULY 31, 2004
JOB NO.:	25365157
DRAWN BY:	MAR
CHK'D BY:	EM
SCALE:	AS SHOWN

URS
1701 GOLF ROAD, SUITE 1000
ROLLING MEADOWS, ILLINOIS 60008
PHONE: 847.228.0707
FAX: 847.228.1115



LEGEND:

= SANITARY SEWER LINE

= WATER LINE

NORTH

1000 0 1000 2000

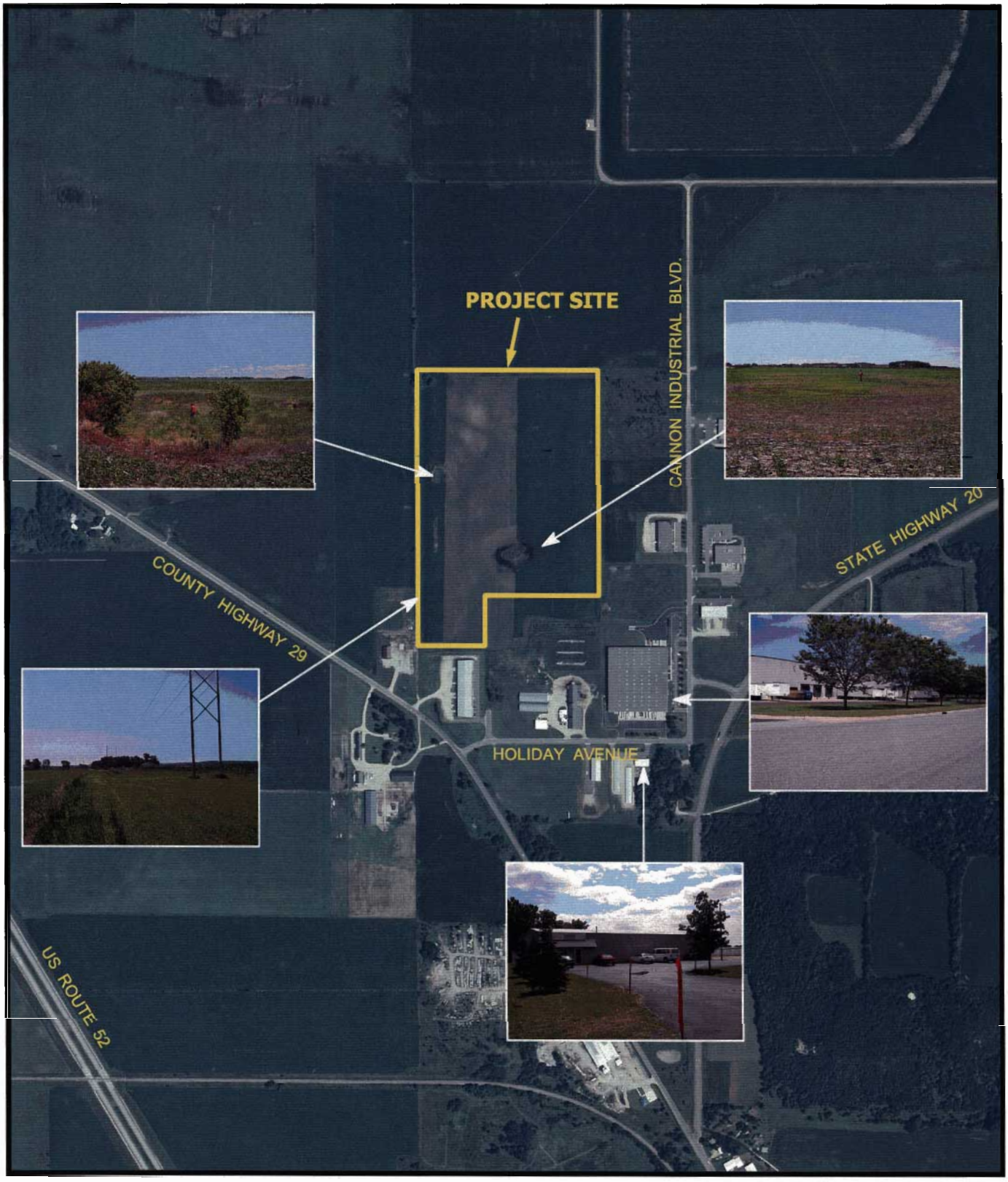
SCALE IN FEET

CANNON FALLS ENERGY CENTER
CANNON FALLS, MINNESOTA

FIGURE 10
WATER AND SANITARY SEWER LINES

DATE: JULY 26, 2004	
JOB NO.: 25365157	
DRAWN BY: MAR	CHK'D BY: EM
SCALE: AS SHOWN	

URS
1701 GOLF ROAD, SUITE 1000
ROLLING MEADOWS, ILLINOIS 60008
PHONE: 847.228.0707
FAX: 847.228.1115



AERIAL MAP REFERENCE:

PORTION OF MINNESOTA DEPARTMENT OF NATURAL RESOURCE;
FARM SERVICES AGENCY (FSA) COLOR ORTHOPHOTOS (DOQs) DATED 2002
CANNON FALLS, DAKOTA COUNTY, MINNESOTA

NORTH

500 0 500 1000

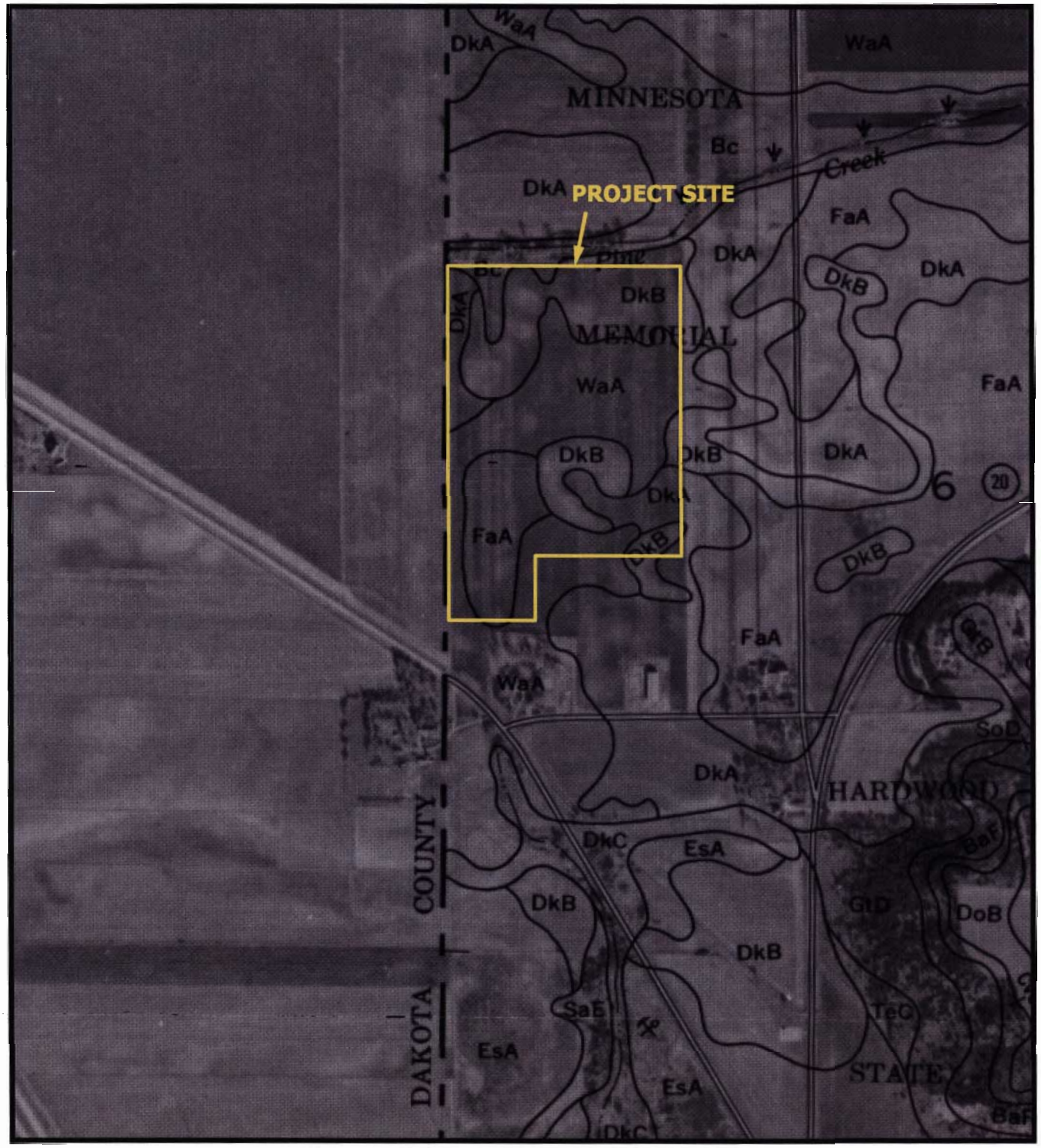
SCALE IN FEET

CANNON FALLS ENERGY CENTER
CANNON FALLS, MINNESOTA

FIGURE 11
VIEWS OF EXISTING SITE CONDITIONS

DATE: JUNE 28, 2004	
JOB NO.: 25365157	
DRAWN BY: MAR	CHK'D BY: EM
SCALE: AS SHOWN	

URS
1701 GOLF ROAD, SUITE 1000
ROLLING MEADOWS, ILLINOIS 60008
PHONE: 847.228.0707
FAX: 847.228.1115



NORTH

400 0 400 800

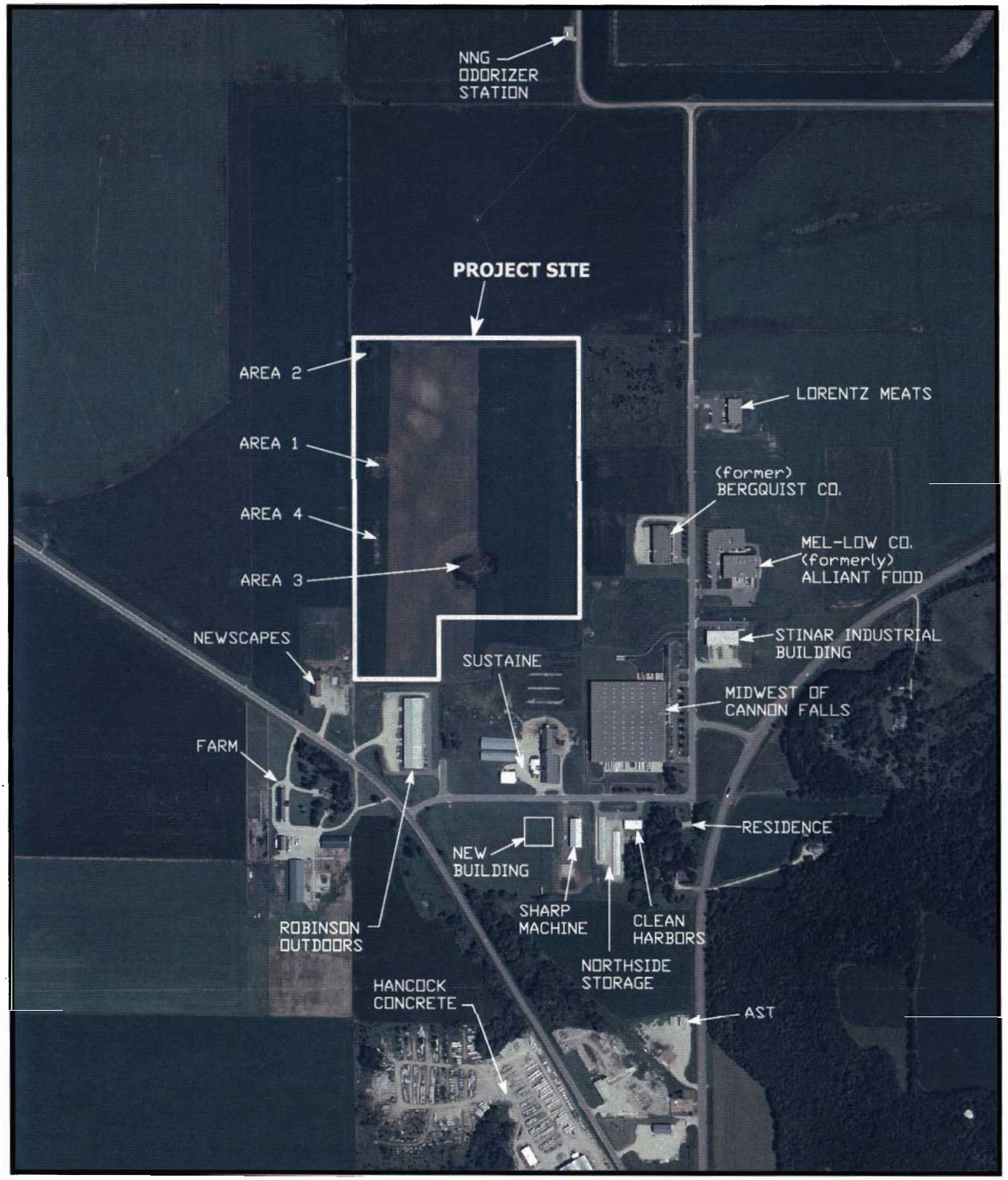
SCALE IN FEET

CANNON FALLS ENERGY CENTER
CANNON FALLS, MINNESOTA

FIGURE 12
PROJECT SITE SOIL TYPES

DATE: JULY 26, 2004	
JOB NO.: 25365157	
DRAWN BY: MAR	CHK'D BY: EM
SCALE: AS SHOWN	

URS
1701 GOLF ROAD, SUITE 1000
ROLLING MEADOWS, ILLINOIS 60008
PHONE: 847.228.0707
FAX: 847.228.1115



AERIAL MAP REFERENCE:

PORTION OF MINNESOTA DEPARTMENT OF NATURAL RESOURCE;
FARM SERVICES AGENCY (FSA) COLOR ORTHOPHOTOS (DOQs) DATED 2002
CANNON FALLS, DAKOTA COUNTY, MINNESOTA

NORTH

400 0 400 800

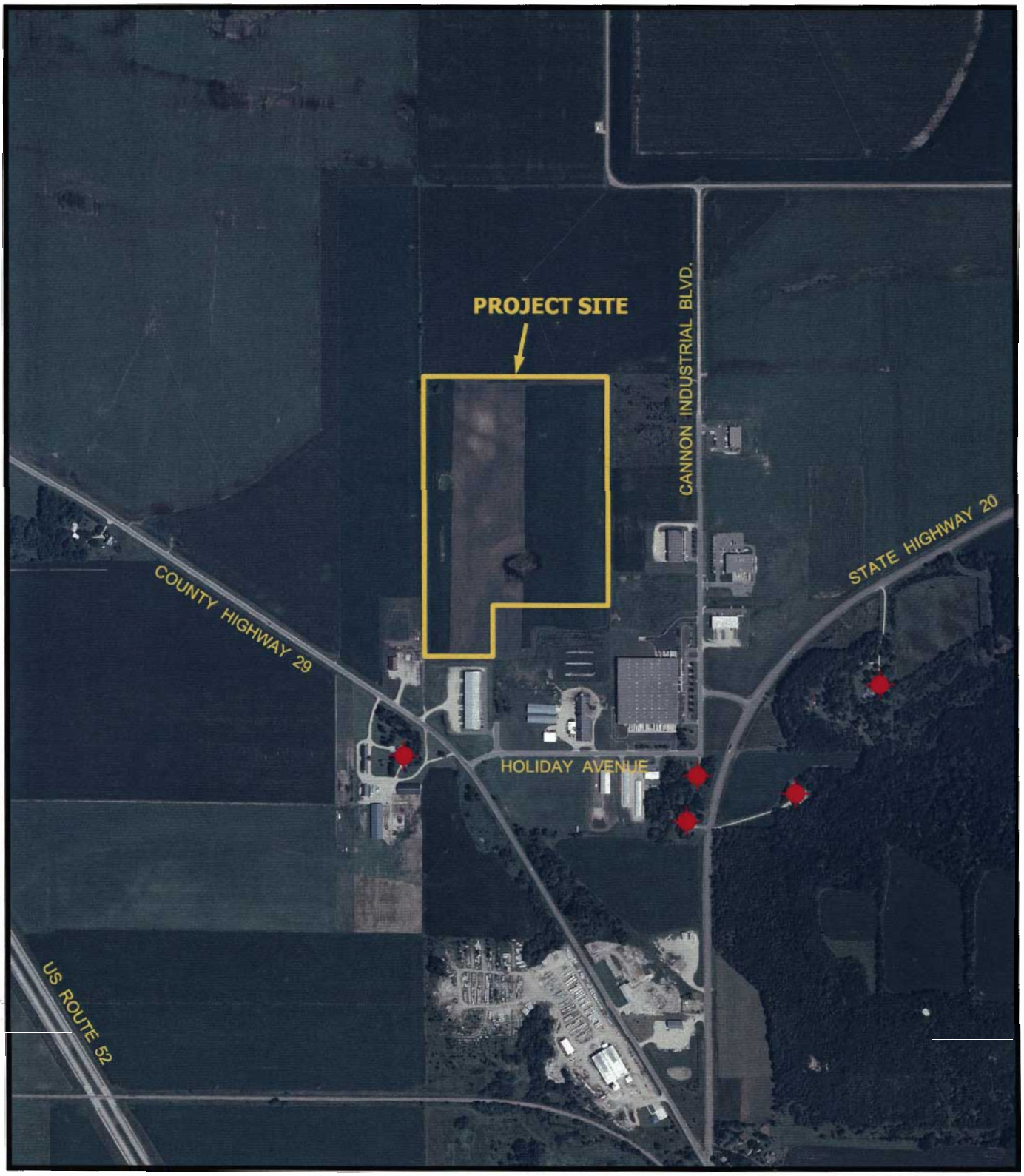
SCALE IN FEET

CANNON FALLS ENERGY CENTER
CANNON FALLS, MINNESOTA

FIGURE 13
DEPRESSION AREAS AND STRUCTURES

DATE: JULY 26, 2004	
JOB NO.: 25365157	
DRAWN BY: MAR	CHK'D BY: EM
SCALE: AS SHOWN	

URS
1701 GOLF ROAD, SUITE 1000
ROLLING MEADOWS, ILLINOIS 60008
PHONE: 847.228.0707
FAX: 847.228.1115



LEGEND:

= SENSITIVE RESIDENTIAL NOISE RECEPTOR LOCATION

NORTH

500 0 500 1000

SCALE IN FEET

AERIAL MAP REFERENCE:

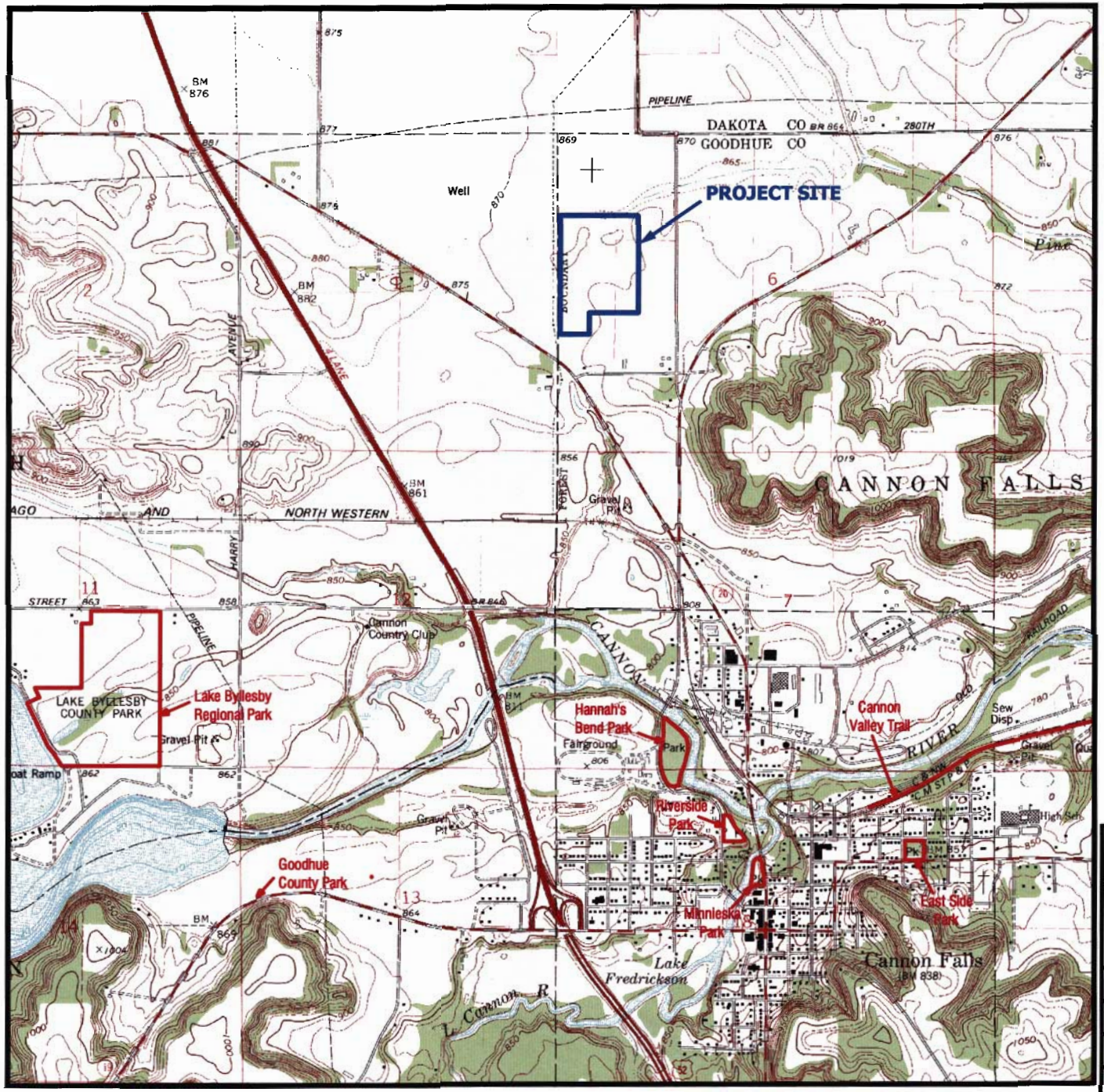
PORTION OF MINNESOTA DEPARTMENT OF NATURAL RESOURCE; FARM SERVICES AGENCY (FSA) COLOR ORTHOPHOTOS (DOQs) DATED 2002 CANNON FALLS, DAKOTA COUNTY, MINNESOTA

CANNON FALLS ENERGY CENTER
CANNON FALLS, MINNESOTA

FIGURE 14
SENSITIVE NOISE RECEPTORS - PROJECT AREA RESIDENCES

DATE: JUNE 28, 2004	
JOB NO.: 25365157	
DRAWN BY: MAR	CHK'D BY: EM
SCALE: AS SHOWN	

URS
1701 GOLF ROAD, SUITE 1000
ROLLING MEADOWS, ILLINOIS 60008
PHONE: 847.228.0707
FAX: 847.228.1115



NORTH

1250 0 1250 2500

SCALE IN FEET

QUADRANGLE LOCATION

MAP REFERENCE:

PORTION OF U.S.G.S. QUADRANGLE MAP
7 ½ MINUTE SERIES (TOPOGRAPHIC)
CANNON FALLS, MINNESOTA 1974

CANNON FALLS ENERGY CENTER
CANNON FALLS, MINNESOTA

FIGURE 15
RECREATION AREAS NEAR PROJECT SITE

DATE:	JULY 8, 2004
JOB NO.:	25365157
DRAWN BY:	MAR
CHK'D BY:	EM
SCALE:	AS SHOWN

URS
1701 GOLF ROAD, SUITE 1000
ROLLING MEADOWS, ILLINOIS 60008
PHONE: 847.228.0707
FAX: 847.228.1115

PROJECT SITE

NORTH

SCALE:

1 .75 1.5 MILE

1500 0 1500 3000 FEET

0 .75 1.5 KILOMETER

MAP REFERENCE:

PORTION OF U.S.G.S. QUADRANGLE MAP
7 ½ MINUTE SERIES (TOPOGRAPHIC)
RANDOLPH, MINNESOTA 1974;
CANNON FALLS, MINNESOTA 1974;
SOGN, MINNESOTA 1968
PHOTOREVISED 1980 and
DENNISON, MINNESOTA 1960

QUADRANGLE LOCATION

CANNON FALLS ENERGY CENTER
CANNON FALLS, MINNESOTA

FIGURE 16
AIRPORTS NEAR PROJECT SITE

DATE: JULY 12, 2004	
JOB NO.: 25365157	
DRAWN BY: MAR	CHK'D BY: EM
SCALE: AS SHOWN	

URS
1701 GOLF ROAD, SUITE 1000
ROLLING MEADOWS, ILLINOIS 60008
PHONE: 847.228.0707
FAX: 847.228.1115

LEGEND:

= 100 yr FLOODPLAIN

= 500 yr FLOOPLAIN

= WETLAND

NORTH

500 0 500 1000

SCALE IN FEET

AERIAL MAP REFERENCE:

PORTION OF MINNESOTA DEPARTMENT OF NATURAL RESOURCE; FARM SERVICES AGENCY (FSA) COLOR ORTHOPHOTOS (DOQs) DATED 2002 CANNON FALLS, DAKOTA COUNTY, MINNESOTA

CANNON FALLS ENERGY CENTER
CANNON FALLS, MINNESOTA

FIGURE 17
PROJECT AREA
FLOODPLAINS AND WETLANDS

DATE:	JULY 31, 2004
JOB NO.:	25365157
DRAWN BY:	MAR
CHK'D BY:	EM
SCALE:	AS SHOWN

URS
1701 GOLF ROAD, SUITE 1000
ROLLING MEADOWS, ILLINOIS 60008
PHONE: 847.228.0707
FAX: 847.228.1115

APPENDIX A

NOISE LEVEL EVALUATION FOR THE CANNON FALLS ENERGY CENTER

Noise Level Evaluation for the Cannon Falls Energy Center

July 2004
Report No. 1725

Prepared for: **Invenergy, L.L.C.**
233 South Wacker, Suite 9450
Chicago, IL 60606
(312) 224-1417 Office
(312) 707-9045 Fax

Prepared by: **Michael Theriault Acoustics, Inc.**
3 Worcester Square, Suite 6
Boston, MA 02118
(617) 437-9887
(617) 437-9343 Fax

Table of Contents

Figures:

Appendix:

1.0 Executive Summary

Invenergy Cannon Falls, L.L.C. proposes to construct and operate the Cannon Falls Energy Center (Facility), a nominal 357-megawatt combustion turbine power generation facility, in Cannon Falls, Minnesota. In support of Invenergy's permit applications to construct and operate the Facility, an evaluation was conducted to examine noise emissions from the Project. The assessment consisted of: (1) predicting Facility noise levels at nearby residences potentially affected by noise using three-dimensional computer modeling techniques; and (2) comparing projected Facility noise levels at nearby homes to State of Minnesota noise standards.

Results of the analysis showed that given the proposed acoustical design of the Facility, noise emissions are expected to fully comply with performance standards established by the State of Minnesota. Although the specific type and amount of noise control needed to achieve compliance with Minnesota standards will be selected during the detailed design phase of the Facility, a successful mitigation program that maintains an adequate design margin will likely consist of the following components:

- Combustion Turbine Exhaust Silencers
- Combustion Turbine Air Intake Silencers
- Low-Noise Fuel Gas Metering Station

2.0 Site Description

The proposed site is located along Cannon Industrial Boulevard, between County Highway 29 and State Highway 20, in Cannon Falls, Minnesota. A topographic map of the site is shown in Figure 1. Surrounding land use consists of industrial, agricultural and residential properties. The nearest noise sensitive receiver is a residence approximately 1400 feet southwest of the proposed Facility's operating equipment. Additional residential properties lie to the southeast of the site, near State Highway 20, as identified in Table 1 and shown in Figure 2.

Table 1
Nearest Residential Noise-Sensitive Properties

Residence 1	Intersection of County Highway 29 and Holiday Avenue
Residence 2	West Side of State Highway 20
Residence 3	Intersection of Holiday Avenue and Cannon Industrial Boulevard
Residence 4	Southeast Side of State Highway 20
Residence 5	Southeast Side of State Highway 20

3.0 Applicable Noise Regulations

The State of Minnesota Rules, Chapter 7030.0040, limits noise levels resulting from new land uses according to Noise Area Classification (NAC). The most stringent standard applies to land use classifications (NAC 1) that include the most sensitive noise receptors: households, medical service providers, cultural and recreational activities, etc. The least stringent standard applies to land use classifications (NAC 3) that would include the proposed Facility and other industrial activities such as manufacturing, transportation, and agriculture. Table 2 summarizes these noise standards by class. Note that because noise emissions from the Facility will generally be steady-state (non-fluctuating), the predicted L_{10} and L_{50} sound levels will be equivalent to each other. Therefore, the L_{50} represents a more restrictive performance criteria.

Table 2
Minnesota Noise Performance Standards (dBA)

1	60	65	50	55
2	65	70	65	70
3	75	80	75	80

4.0 Acoustical Modeling

A three-dimensional acoustical model of the proposed Project was developed using SoundPlan® 6.2, based on site plan and general arrangement drawings provided by Invenergy and URS (*see Figure 3*) to predict noise levels at off-site residential receivers. Sound power levels (PWL) for all major pieces of equipment were estimated using octave band data from manufacturers, in-house field data, and data from industry-standard prediction algorithms.[1] (Sound power levels provide a convenient means to describe the total amount of noise radiated by a piece of equipment).

Equipment power levels were adjusted for the reduction of sound by distance (*geometrical spreading);* the molecular absorption of sound by air (*air absorption*); and the absorption and reflection of sound by the ground (*ground effect).* Sound power levels were further modified by the effects of shielding, (i.e., tank farms, buildings, equipment, etc.) and by changes in source levels with direction (*directivity)* to estimate off-site noise levels.

---

[2] *Electric Power Plant Environmental Noise Guide*, Edison Electric Institute, N.Y., N.Y.

4.1 Modeling Parameters

The acoustical model used for the analysis is based on ISO 9613-2, "Attenuation of Sound during Propagation Outdoors" adopted by the International Standardization Organization (ISO) in 1996. This standard provides a widely-accepted engineering method for the calculation of outdoor environmental noise levels from sources of known sound emission. The following sections briefly describe the conditions under which the predictions are considered valid.

4.1.1 Meteorology

The absorption (attenuation) of sound by air is strongly dependent on frequency, temperature and relative humidity, but only weakly on atmospheric pressure. In general, low temperatures and low humidity increase high-frequency sound absorption, which tends to reduce far-field predicted noise levels. For this analysis, mean annual atmospheric conditions near the project site for the period of record from 1961 through 1990 were obtained from the National Climatic Data Center (NCDC). Specifically, mean annual temperature, relative humidity and barometric pressure values used in the analysis were 43 °F, 70% RH, and 1017 mbars, respectively.

ISO 9613 is designed to estimate far-field noise levels under favorable sound-propagation conditions, (that is, when wind is blowing from the Facility towards receivers, at a speed roughly between 2 and 11 mph, when measured at a height of 10 to 36 feet above the ground) or under well-developed temperature inversions, which commonly occur on clear, calm nights.[2] For other weather conditions, such as during crosswind or upwind situations, or for ground based temperature lapses, *(see Footnote 2)* observed noise levels would generally be less than predicted.

---

[2] Temperature inversions typically develop during calm, cloudless nights, when the ground is no longer being heated by the sun. As a result, air near the ground begins to cool, forming a thicker and thicker "blanket" as the evening progresses. In practical terms, this means that temperature is ***increasing*** with elevation, (i.e., the air is actually warmer at higher elevations, as compared to near the ground) and hence the term "temperature inversion." The effect of temperature inversion on sound propagation is to "bend" sound waves back towards the ground, producing near worse-case noise levels at a receiver. In contrast, "temperature lapse" commonly develops during calm, cloudless ***daytime*** periods, when the ground is being heated by the sun, which in turn produces a warm layer of air next to the ground, as opposed to at higher elevations. This means that temperature ***decreases*** with elevation, causing sound waves to bend upwards and reducing noise levels observed at a far-field observer.

4.1.2 Ground Effect

Noise level predictions are largely dependant on both the type and extent of "ground" condition assumed for the site and receiver areas. Areas of ground at the Project site were modeled as "hard" or completely reflective, which is typical of paving, concrete, tamped ground, water, and other ground surfaces commonly found at industrial sites. Ground areas near receivers were assumed to be 50% absorptive, which is characterized as semi-porous ground.

4.1.3 Reflections

For complex installations with a large number of buildings and obstacles, reflected energy components can be considerable. Therefore, the number of reflections for the model was set at two (2). This means that two reflections from buildings and obstacles were allowed for individual acoustic rays.

4.1.4 Model Accuracy

ISO 9613 predictions are expected to agree with field measurements within a ± 3 dBA range, out to a distance of 1000 meters, for the meteorological and environmental conditions described above. This implies that actual levels observed in the field might be up to three (3) decibels lower than predicted, or three (3) decibels higher. Due to this accuracy limitation, all calculations include a design margin of three (3) decibels, which is the minimum recommended to account for: 1) inherent modeling inaccuracies and meteorological changes in sound propagation; 2) addition and/or changes to Facility equipment at later design changes; 3) equipment supplied louder than specified; 4) measurement uncertainty in determining source emissions; 5) lack of vender octave band data, (which is required for accurate sound propagation calculations); and 6) inability to secure commercial noise emission guarantees from equipment suppliers.

4.2 Modeling Results

Noise levels are expected to range from about 45 to 50 dBA at the nearest receivers given the proposed acoustical design of the Facility, as shown in Table 3. Analysis results are also presented as a series of noise level contours in Figure 4, and a complete set of modeling calculations can be found in the Appendix. Note that although minor changes to the general arrangement of the Facility may occur as the detailed design is finalized, significant changes in predicted noise levels are not expected.

Table 3
Predicted Facility Noise Levels (with Controls)

[illegible]	[illegible]	[illegible]
Residence 1	Intersection of County Highway 29 and Holiday Avenue	47.4
Residence 2	West Side of State Highway 20	44.6
Residence 3	Intersection of Holiday Avenue and Cannon Industrial Boulevard	45.4
Residence 4	Southeast Side of State Highway 20	48.3
Residence 5	Southeast Side of State Highway 20	49.5

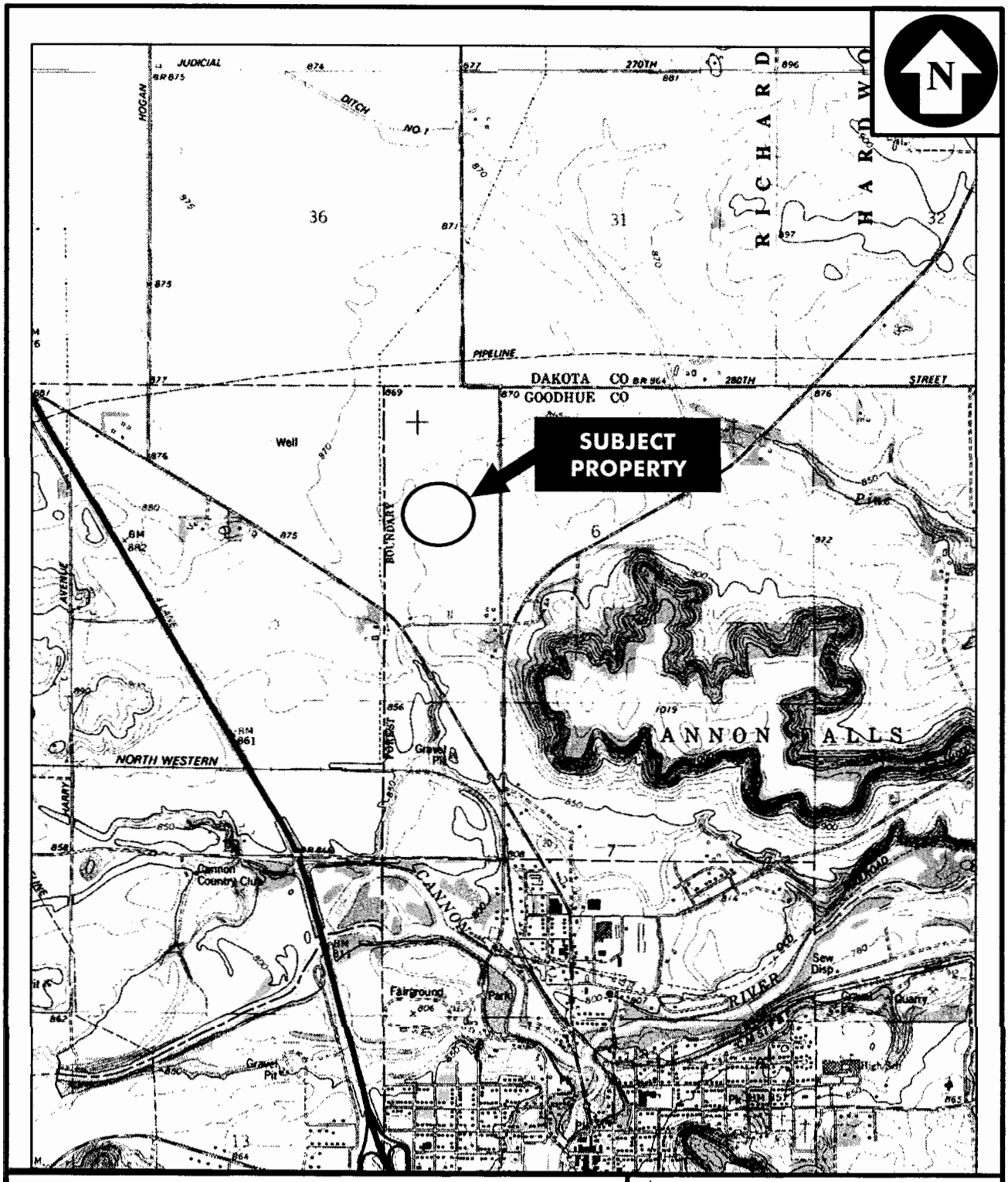
5.0 Noise Level Assessment

Noise emissions at the nearest receptors are expected to range from 45 dBA to 50 dBA, given the proposed acoustical design of the plant, as shown in Table 3. Therefore, Facility noise levels are expected to fully comply with limits established by the State of Minnesota, (60 dBA during daytime hours; 50 dBA during nighttime hours).

6.0 Conceptual Noise Controls

The specific type and amount of noise control needed to achieve compliance with the State of Minnesota noise control standards will be selected during the detailed design phase of the Facility. A successful mitigation program will likely consist of the following components:

- Combustion Turbine Exhaust Silencers
- Combustion Turbine Air Intake Silencers
- Low-Noise Fuel Gas Metering Station



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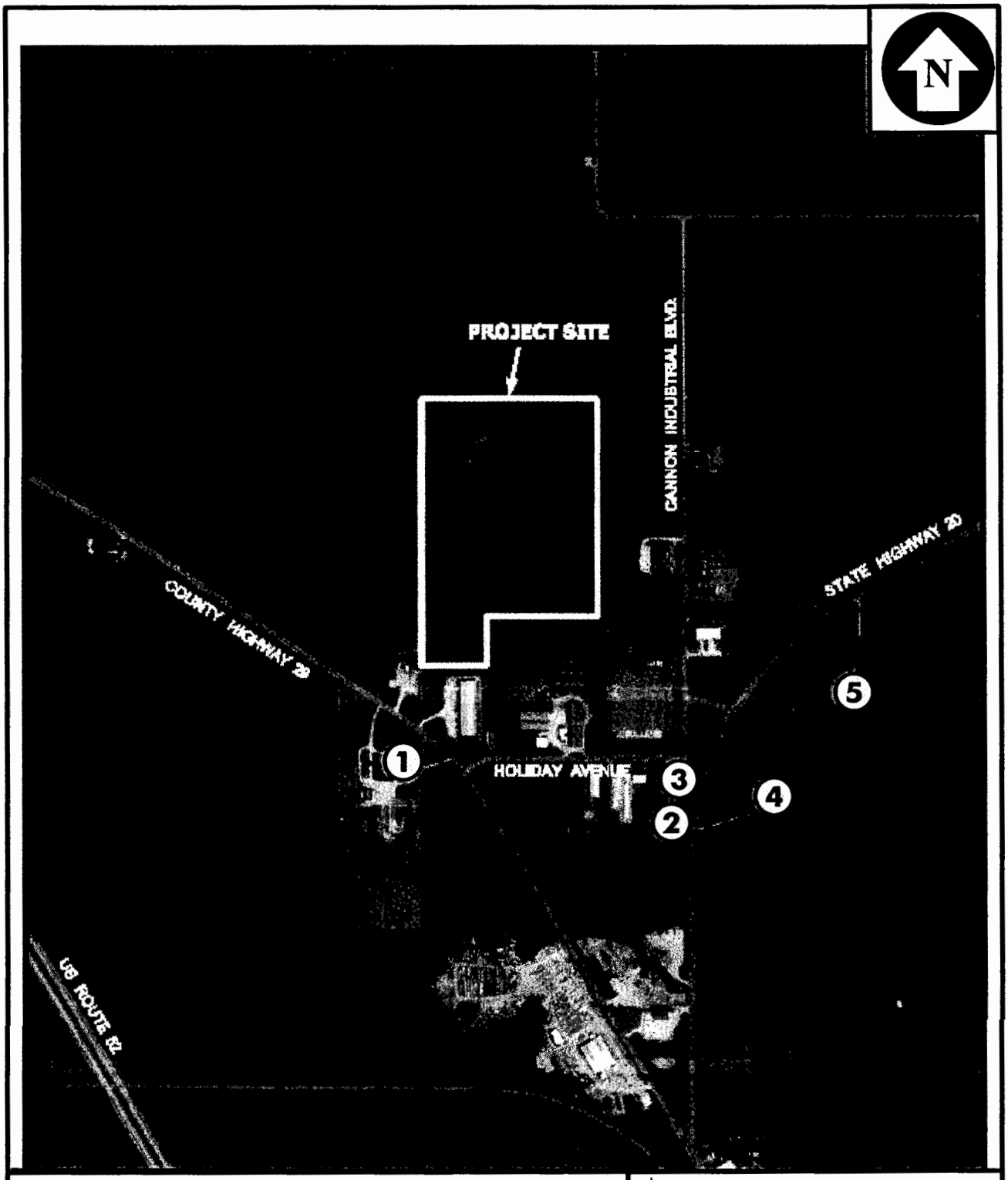
SITE AREA MAP

CANNON FALLS ENERGY CENTER
CANNON FALLS, MINNESOTA

FIGURE 1	PROJ. NO. 1725



0 1000 2000 3000

Scale in Feet

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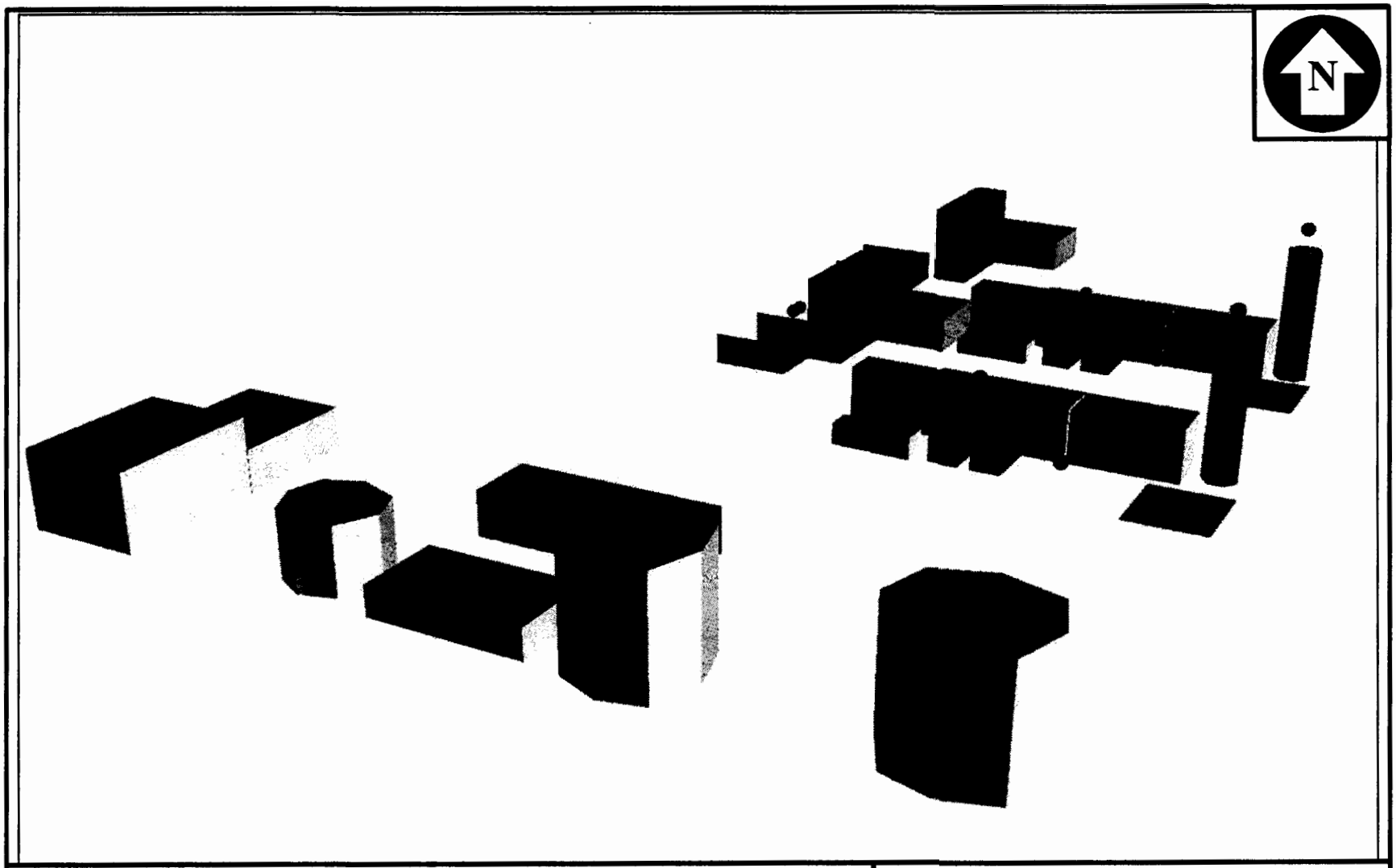
RESIDENTIAL RECEIVER LOCATIONS

CANNON FALLS ENERGY CENTER
CANNON FALLS, MINNESOTA

FIGURE 2	PROJ. NO. 1725



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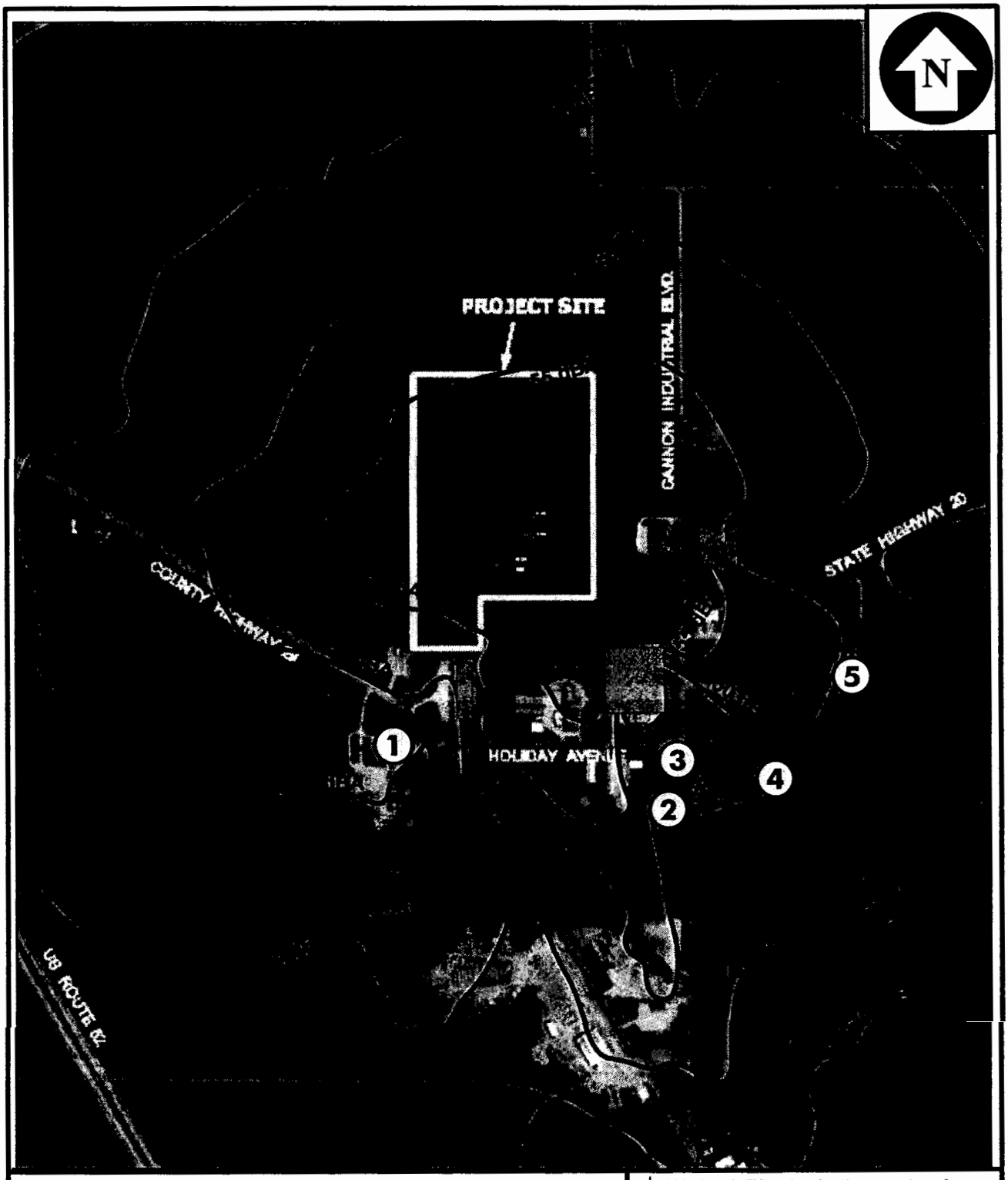
THREE DIMENSIONAL ACOUSTICAL MODEL VIEW

CANNON FALLS ENERGY CENTER
CANNON FALLS, MINNESOTA

FIGURE 3	PROJ. NO. 1725



CONTOURS INCLUDE 3 dBA DESIGN MARGIN

0 1000 2000 3000

Scale in Feet

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PREDICTED NOISE LEVEL CONTOURS

CANNON FALLS ENERGY CENTER
CANNON FALLS, MINNESOTA

FIGURE 4	PROJ. NO. 1725